

What is claimed is:

1. A cathode composition comprising vanadium oxide particles having an average diameter less than about 1000 nm and a binder.

5 2. The cathode composition of claim 1 wherein the vanadium oxide particles have an average diameter from about 150 nm to about 5 nm.

3. The cathode composition of claim 1 wherein the vanadium oxide particles have an average diameter from about
10 50 nm to about 5 nm.

4. The cathode composition of claim 1 wherein the binder comprises polyvinylidene fluoride, polyethylene oxide, polyethylene, polypropylene, polytetrafluoroethylene, polyacrylates or mixtures or copolymers thereof.

15 5. The cathode composition of claim 1 further comprising supplementary electrically conductive particles.

6. The cathode composition of claim 5 wherein the supplementary electrically conductive particles comprise carbon.

20 7. The cathode composition of claim 1 wherein the cathode comprises from about 60 percent by weight to about 98 percent by weight vanadium oxide particles.

8. A battery comprising an anode, a cathode comprising vanadium oxide particles having an average
25 diameter less than about 1000 nm and a binder, and a separator element disposed between the anode and cathode.

9. The battery of claim 8 wherein the anode comprises lithium metal.

30 10. The battery of claim 8 wherein the anode comprises a composition that intercalates lithium.

11. The battery of claim 10 wherein the intercalation compound within the anode comprises carbon.

12. The battery of claim 8 wherein the vanadium oxide particles have an average diameter from about 150 nm to about 5 nm.

13. The battery of claim 8 wherein the separator element comprises a polymer electrolyte.

14. The battery of claim 8 wherein the separator element comprises a porous polymeric material.

15. A battery comprising an anode, an electrolyte, a cathode and a separator element disposed between the anode and the cathode, the electrolyte comprising lithium ions and the cathode comprising nanoparticles of intercalation type electroactive material and a binder, wherein the electroactive material in the cathode exhibits an energy density greater than about 900 Wh/kg during discharge of the battery.

16. The battery of claim 15 wherein the battery is a secondary battery.

17. The battery of claim 15 wherein the electroactive material in the cathode exhibits an energy density from about 950 Wh/kg to about 1200 Wh/kg.

18. The battery of claim 15 wherein the electroactive nanoparticles comprise vanadium oxide.

19. The battery of claim 15 wherein the electroactive material in the anode comprises a composition that intercalates lithium.